Final CMC Board of Directors Report

UCLA Project: Approved February 2, 2011 and Concluded June 27, 2017

Table of Contents:

January 31, 2011 Board of Directors Minutes: UCLA Project Proposal…… Page 1-2

February 2, 2011 Email Votes Approving UCLA Project…….. Page 3-11

August 29, 2012 Board of Directors Minutes: Staff Compensation…….. Page 12-13

Final UCLA Project Budget Report 2011-2017…….. Page 14-15

November 13-14, 2016 Board of Directors UCLA Project Briefing…….. Page 16

UCLA Contract with California Metals Coalition…….. Page 17-22

UCLA Contract Statement of Work…… Page 23-29

Virginia Tech Contracts with California Metals Coalition for UCLA Project…….. Page 30-59

Memorandum of Understand with CMC and Japan Measuring Instruments Federation… Page 60

California Metals Coalition
Board of Directors Meeting

Via Conference Call
January 31, 2011

Members Present: J. Mock (Chair), E. Ritelli, B. Hartman, P. Houston, S. Livingston, E. Kangeter, M. Davidson, R. Fumey, D. Robinson, J. Simonelli (ex officio, staff), F. Simonelli (ex officio, staff)

Members Absent: D. Hiestand, R. Perrault, T. Krallman, J. Pratto, B. Walker, F. Schneider, B. Rost,

Call to Order: Chairman Mock called the meeting to order at 1:38 pm

Approval of Minutes: The Board approved the November 9, 2010, November 30, 2010, and January 13, 2011 minutes as submitted.

February 15, 2011 SCAQMD Rule 1147 Conference: J. Simonelli provided an update on SCAQMD's Proposed Amended Rule (PAR) 1147, and CMC's upcoming conference on this issue. S. Livingston suggested that the next flyer be very specific on the type of equipment impacted. J. Simonelli noted that Bill Funderburk (attorney) secured the SCAQMD's list of PAR 1147 affected companies. The list included 7,200 companies. CMC would send a mail invite to 500 metal related companies.

March 28 Energy Conference: Chairman Mock briefed the board that a date had been secured for an energy conference, of which CMC would be hosting. Discussion ensued.

2011 Budget Review: J. Simonelli reviewed the most current budget update. He noted that there was a small discrepancy between the quarterly and monthly reports. Income from Initiative A was accidentally left off of the monthly report. Director Ritelli noted the change. The Board accepted the report.

2011 Dues and Membership Report: J. Simonelli reported on the current membership. Nearly all of Tier A and Tier B companies had paid, as well as most of Tier C. Dues already collected in January 2011 were slightly higher than in January 2010. Chairman Mock noted that in January, he and staff had met with Tier A and Tier B companies. The companies that had not paid yet were still potential candidates for submitting dues later in the year when business picked up. This included P. Kay Metals and Buddy Bar.

2011 PAC Funds: F. Simonelli reviewed the current PAC status and recent donations. There were no major changes to discuss. He also reviewed the special elections expected in 2011. Director Houston commented that the new monthly PAC newsletter was an excellent monthly briefing.

2011 Membership Program: Chairman Mock reviewed the new membership program for building CMC's membership. He noted that letters and brochures had been mailed to all CMC members explaining the new program, its goals, and potential impact on CMC's dues structure. Director Ritelli suggested that the membership committee convene in the following weeks to launch the membership drive. J. Simonelli noted that CMC was updating its website with new features and a cleaner look. Director Houston suggested having subcommittees that could reach out to specific industry sectors.

Network for Local Protection: J. Simonelli briefed the Board that CMC's NLP had been placed on hold, including funding requests from supporters. The NLP will be reconsidered once the BAAQMD releases its draft Metal Melting rule. This is expected in March 2011.

New Business (Freight): Since 2002, the California Cast Metals Association has operated a group savings program for shipping. The program is administered by Logistics Management Inc (LMI), who most commonly uses Saia and UPS Motor Freight. It is a popular program which generates $4,000-$7,000 in annual royalties to CCMA. Royalties are calculated at 1% of total dollars shipped through the LMI program.

The CCMA Board, whose directors are also members of CMC, voted on January 25 to move the program and 2011 royalties to the California Metals Coalition. In exchange for the program, CCMA has asked that CMC donate $1000 back to CCMA by the end of 2011. Also, CMC would pick up the $150/month administrative fee by Simonelli & Associates to operate the program. The CMC Board unanimously voted to accept the terms of the freight program. Future royalties would come to CMC.

New Business (UCLA Project): CMC has been in discussions with UCLA's Dr. Peter Sinsheimer, Executive Director of Sustainable Technology and Policy Program, to conduct testing on "lead free" alloys. California signed a "lead-free" law for products that touch drinking water in 2006. Federal legislation mirroring the state law was signed by President Obama on January 4, 2011. These new laws have greatly increased the interest of "lead-free" alloys in the market.

CMC member California Metal-X has agreed to fund the project, which will cost approximately $110,000. This includes $10,000 for CMC to be held as a retainer for staff time utilized beyond the scope of work. CMC would not be endorsing any company or alloy in this study. CMC would not be involved in any technical aspect of the study. CMC would serve as the organizing agent for the project and assist with establishing the project's advisory board and project panel. J. Simonelli noted that the networking and relationship potential with world-renowned UCLA is tremendous. UCLA's contacts and respect within California's regulatory bodies is also significant, and often is traced back to Dr. Sinsheimer. He also noted that mentioning the relationship with UCLA could be helpful when marketing CMC to potential members. This is important as CMC looks to grow membership in 2011.

Director Ritelli asked who would be conducting the legal review of the project contracts. J. Simonelli responded that CMC-endorsed legal counsel Bill Funderburk has already been briefed and is willing to review the contracts between CMC and UCLA, as well as between CMC and CMX. J. Simonelli also noted that CMC will not be funding any portion of this study. Director Fumey asked for further clarification on CMC's role in the project, as well as to review the project's scope of work. Chairman Mock discussed CMC's role and J. Simonelli noted that he would send the entire board the current scope of work. After further discussion, Chairman Mock suggested that the Board review the materials again, including the project scope of work, and then convene via an email vote to decide whether or not to approve the project. The Board concurred.

Next Meeting: The next Board meeting will be Wednesday, February 23 at 1:30pm via conference call.

Adjourn: Chairman Mock adjourned the meeting at 3:22 PM.

EMAIL VOTE: February 2, 2011: The following vote was conducted by email on the UCLA project. *Yes Votes*: Davidson, Fumey, Houston, Hartman, Kangeter, Livingston, Mock, Ritelli, Robinson. *No Votes*: None.

James Simonelli - CA Metals Coalition

From: Michael Davidson [msd@viplawgroup.com]
Sent: Wednesday, February 02, 2011 9:50 AM
To: james@metalscoalition.com
Subject: RE: Vote Request: CMC Board of Directors (UCLA/CMC)

I apologize James. For some reason I did not get the prior e-mail. I approve.

From: James Simonelli - CA Metals Coalition [mailto:james@metalscoalition.com]
Sent: Wednesday, February 02, 2011 9:31 AM
To: Michael Davidson
Subject: FW: Vote Request: CMC Board of Directors (UCLA/CMC)

Sorry to bother you, but you are the last vote I'm waiting on. Thanks, James

James Simonelli, Executive Director
California Metals Coalition
2971 Warren Lane, El Dorado Hills CA 95762
1215 K Street, 17th Flr, Sacramento CA 95814
916.933.3075 | fax 916.933.3072

From: James Simonelli - CA Metals Coalition [mailto:james@metalscoalition.com]
Sent: Tuesday, February 01, 2011 2:22 PM
To: 'board@metalscoalition.com'
Subject: Vote Request: CMC Board of Directors (UCLA/CMC)

To: CMC Board of Directors

This email is a request for your vote on the following item discussed at yesterday's Board Meeting. Please reply with a YES or NO vote, which will be recorded in the meeting minutes.

BRIEF BACKGROUND: CMC has the opportunity to serve as the coordinating agent for a research project that will be conducted by Dr. Peter Sinsheimer of UCLA, and funded by CMC-member California Metal-X. The initial scope of the project is attached. CMC will not be the technical lead, conducting any research, or endorsing any of the results. Our role is to facilitate the coordination of the project.

MOTION FOR VOTE: The CMC Board vote would be to allow CMC's Executive Officers (Jeff Mock and Ed Ritelli) and Executive Director (James Simonelli) to begin the contract process with UCLA. The contract will be done by CMC-endorsed legal counsel Bill Funderburk. A contract with California Metal-X to memorialize funding will also be established. CMC will not be funding any portion of this study.

Thank you for your time and vote. James

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James Simonelli - CA Metals Coalition

From: Roger Fumey [roger@atlaspacific.net]
Sent: Tuesday, February 01, 2011 3:55 PM
To: james@metalscoalition.com
Subject: RE: Vote Request: CMC Board of Directors (UCLA/CMC)

Hi James
I vote "Yes"
Roger

From: James Simonelli - CA Metals Coalition [mailto:james@metalscoalition.com]
Sent: Tuesday, February 01, 2011 2:22 PM
To: board@metalscoalition.com
Subject: Vote Request: CMC Board of Directors (UCLA/CMC)

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James Simonelli - CA Metals Coalition

From: Brad Hartman [brad@sandcast-parts.com]
Sent: Tuesday, February 01, 2011 3:04 PM
To: james@metalscoalition.com
Subject: RE: Vote Request: CMC Board of Directors (UCLA/CMC)

Yes, Brad Hartman

From: James Simonelli - CA Metals Coalition [mailto:james@metalscoalition.com]
Sent: Tuesday, February 01, 2011 2:22 PM
To: board@metalscoalition.com
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James Simonelli - CA Metals Coalition

From: Patricia Houston [patricia.houston@bazz-houston.com]
Sent: Monday, January 31, 2011 4:09 PM
To: james@metalscoalition.com; thorock1@aol.com
Subject: CMC Meeting

James & Jeff,

Congratulations on a tough meeting.

Personally, I feel that we should pursue the research project with California Metal-X and UCLA. I think that as you both pointed out it's vital that we reach out to people like Dr. Peter Sinsheimer. Plus it shows our organization as part of the solution and not the problem.

I'll look forward to seeing the email you send out later.

Patricia

Patricia Houston
Marketing
Bazz Houston Co.
patricia.houston@bazz-houston.com
(714) 898-2666 Ext. 225

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James Simonelli - CA Metals Coalition

From: Edward Kangeter IV [edward@customalloy.com]
Sent: Tuesday, February 01, 2011 4:23 PM
To: james@metalscoalition.com
Cc: board@metalscoalition.com
Subject: Re: Vote Request: CMC Board of Directors (UCLA/CMC)

Yes

Edward B. Kangeter IV
Chief Executive Officer

CASS, Inc.
2730 Peralta Street
Oakland , CA 94607 , U. S. A.
TEL: 510.893.6476

E-MAIL: edward@customalloy.com
WEB-SITE: http://customalloy.com

Recycling for our future.

On Feb 1, 2011, at 2:21 PM, James Simonelli - CA Metals Coalition wrote:

To: CMC Board of Directors

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Thank you for your time and vote. James

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<CMC Board -- AA Phase I Deliverables, Timeline, and Budget ver 6.pdf>

James Simonelli - CA Metals Coalition

From: Steve Livingston [steve@smccast.com]
Sent: Wednesday, February 02, 2011 4:05 PM
To: james@metalscoalition.com
Subject: RE: Vote Request: CMC Board of Directors (UCLA/CMC)

James,

I vote yes on this topic of UCLA/CMC.

Steve Livingston

From: James Simonelli - CA Metals Coalition [mailto:james@metalscoalition.com]
Sent: Tuesday, February 01, 2011 2:22 PM
To: board@metalscoalition.com
Subject: Vote Request: CMC Board of Directors (UCLA/CMC)

To: CMC Board of Directors

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James Simonelli - CA Metals Coalition

From: thorock1@aol.com

Sent: Tuesday, February 01, 2011 2:27 PM

To: james@metalscoalition.com

Subject: Re: Vote Request: CMC Board of Directors (UCLA/CMC)

Yes!

Jeff Mock

-----Original Message-----
From: James Simonelli - CA Metals Coalition <james@metalscoalition.com>
To: board@metalscoalition.com
Sent: Tue, Feb 1, 2011 2:21 pm
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Thank you for your time and vote. James

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California Metals Coalition
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James Simonelli - CA Metals Coalition

From: Ed Ritelli, Jr. [edjr@genfoundry.com]
Sent: Tuesday, February 01, 2011 2:27 PM
To: James Simonelli; board@metalscoalition.com
Subject: re: Vote Request: CMC Board of Directors (UCLA/CMC)

Yes.

Ed Ritelli, Jr.
General Manager
General Foundry Service
1390 Business Center Place
San Leandro, CA 94577
510-297-5040
510-614-2171 Fax
www.genfoundry.com
Since 1946, Celebrating Our "65th" Year of Service.
---------- **Original Message** ----------

From: "James Simonelli - CA Metals Coalition" <james@metalscoalition.com>
To: <board@metalscoalition.com>
Cc:
Date: Tue, 1 Feb 2011 14:21:51 -0800
Subject: **Vote Request: CMC Board of Directors (UCLA/CMC)**

To: CMC Board of Directors

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James Simonelli - CA Metals Coalition

From: Dave Robinson [Dave.Robinson@abifoundry.com]

Sent: Tuesday, February 01, 2011 3:57 PM

To: james@metalscoalition.com

Subject: RE: Vote Request: CMC Board of Directors (UCLA/CMC)

James, my vote is yes. I would hope over the years your very familar with these situations, so unfortunitly felt the conversation on the subject was far too long and somewhat a waste of time. Also, not sure if I have it but could I get a summary of the PAC fund and who/how much was donated by various individuals. Not sure if its confidential or board members have access, but would like to know, in order to get an idea of the magnitude of AB&I contribution and future commitment to the program. Thanks, Dave

---

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California Metals Coalition
Board of Directors Meeting

Via Conference Call
August 29, 2012

Members Present: E. Ritelli, B. Hartman, M. Davidson, R. Fumey, B. Rost, B. Walker, P. Houston, L. Larson, G. Van Steenberge, J. Mock, M. Dameron, T. Joseff, E. Kangeter, J. Simonelli (ex officio, staff)

Members Absent: D. Robinson, N. Drakos, K. Johnson, J. Van Hiel

Call to Order: Chairman Ritelli called the meeting to order at 1:33pm

Approval of Minutes: The Board approved the June 28, 2012 minutes as submitted.

Establish CMC Positions on Proposition 30-40: Chairman Ritelli disseminated the list of November 6 propositions and CMC's proposed positions. J. Simonelli reviewed each Proposition and answered questions. The board unanimously voted to Support Propositions 31 and 32; Oppose Proposition 40; and Neutral on Propositions 33, 34, 35, 36, 37, 39. The board voted to oppose Propositions 30 and 38, but with a majority vote. Voting against the CMC position on Proposition 30 was R. Fumey and B. Hartman, and B. Rost abstained. Voting against the CMC position on Proposition 38 was R. Fumey.

Storm Water Draft Permit Update: J. Simonelli reviewed the draft industrial storm water permit. He noted that CMC testified in front of the State Water Board and secured a 30-day extension for public comments. He also reviewed the upcoming CMC seminars on storm water, which will be held September 20 in Oakland and September 27 in Downey.

UCLA Project and Simonelli & Associates Compensation: J. Simonelli reviewed the UCLA project on no lead alloys, which is being funded by CMC members and managed by CMC. Chairman Ritelli noted that Simonelli & Associate's work on this project is outside of the current contract and should be compensated separately. Estimated total revenue to CMC for this project is $13,500. The board unanimously voted to provide Simonelli & Associates with 90% of the total funds received by CMC as compensation for the additional work.

Updating CMC Web Site: J. Simonelli requested that CMC allocate up to $5,000 from the general fund to update the CMC web site. It was first created in 2002. The board unanimously approved this request, with a proposed completion date of November 15.

2012 Budget Update: J. Simonelli provided a budget update and answered questions from the board. The board accepted the report.

Chairman Ritelli presented to the board an opportunity for Owens Corning of Santa Clara join CMC. Ritelli noted that he had met with the company Plant Manager twice and toured their facility with Directors Kangeter, Robinson, and Executive Director James Simonelli. Ritelli proposed to the Board that they accept Owens Corning's membership at Tier A, and that Owens Corning also donate $5,000 to the CMC PAC. Director Kangeter commented that while Owens Corning was not a metal company, they were an exceptional manufacturer that is facing many of the same regulatory issues as metal companies, including the BAAQMD PM2.5 draft rule and California's greenhouse gas law. Discussion ensued. The board voted unanimously to accept Ritelli's proposal.

2012 PAC Update: J. Simonelli reviewed the CMC PAC contribution and donation list. Chairman Ritelli asked how CMC is handling the Oakland city council race between Ignacio De La Fuente and Rebecca Kaplan. CMC PAC had supported both candidates in the past. J. Simonelli responded that CMC PAC will donate to both candidates, with $750 going to De La Fuente and $250 going to Kaplan. The Board accepted the report.

SPECIAL GUEST: By telephone, Assemblymember Jeff Miller (R) joined the CMC Board of Directors meeting to discuss the final days of the legislative session, the November propositions and his race for state Senate. Miller stepped off the Assembly floor to make the call.

Miller answered questions from the group and also discussed issues such as Storm Water and how the Legislature interacts with state agencies, such as CARB. J. Simonelli noted Miller's recent public support for the issues impacting CMC members. Discussion ensued. The board thanked Assemblymember Miller for joining CMC on the call.

Next Meeting: The next Board meeting will be via conference call on September 26, 2012, 1:30pm.

Adjourn: Chairman Ritelli adjourned the meeting at 2:39 PM.

CMC Project: UCLA alternative analysis of non-leaded alloys for public water system applications
Report to the CMC Board of Directors (Condensed)
As of June 6, 2017

Income

UCLA Project (Chase Brass)	$236,000.00
UCLA Project (Cal Metal X)	$164,000.00
UCLA Project (Concast)	$50,000.00
UCLA Project (Ingot Metal)	$164,000.00
UCLA Project (Wieland)	$40,000.00
UCLA Project (Mitsubishi Shindoh)	$75,000.00
Total	$729,000.00

Expenses

UCLA	$453,000.00
Virginia Tech	$163,696.58
Labs	$19,127.00
Japan Measuring Instruments Federation (JMIF)	$6,162.00
CMC	$87,014.42
Total	$729,000.00

Notes:
CMC received 10% (per board approval on 8/29/12) of the total $87,014.42
Breakdown of CMC's $8,701.44
$135 Fees
$1,000 Concast dues
$1,871.60 Travel/Credit Card
$76.19 Misc
$1,502.47 Shipping
$4,116.18 (reflected in CMC 2017 budget as income under Industry Initiative B)

CMC Project: UCLA alternative analysis of non-leaded alloys for public water system application

Report to the CMC Board of Directors

As of June 6, 2017

Notes: Highlighted = unpaid pledges

	4th Qtr 2011	1st Qtr 2012	2nd Qtr 2012	3rd Qtr 2012	4th Qtr 2012	1st Qtr 2013	2nd Qtr 2013	3rd Qtr 2013	4th Qtr 2013	1st Qtr 2014	2nd Qtr 2014	3rd Qtr 2014	Oct/Nov 2014	December '14	1st Qtr 2015	2nd Qtr 2015	3rd Qtr 2015	4th Qtr 2015	1st Qtr 2016	2nd Qtr 2016	3rd Qtr 2016	4th Qtr 2016	1st Qtr 207	Est 2nd Qtr 2017	Est 3rd Qtr 2017	TOTAL
Income																										
UCLA Project (Chase Brass)	0.00	100,000.00	0.00	40,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	57,000.00	0.00	0.00	0.00	0.00	0.00	0.00	39,000.00	0.00	236,000.00
UCLA Project (Cal Metal X)	25,000.00	25,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15,000.00	15,000.00	15,000.00	0.00	0.00	0.00	0.00	65,000.00	0.00	0.00	0.00	0.00	0.00	4,000.00	0.00	164,000.00
UCLA Project (Concast)	0.00	0.00	50,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50,000.00
UCLA Project (Ingot Metal)	0.00	0.00	0.00	24,000.00	0.00	0.00	0.00	16,000.00	0.00	0.00	72,700.00	0.00	0.00	0.00	0.00	0.00	47,300.00	0.00	0.00	0.00	0.00	0.00	0.00	4,000.00	0.00	164,000.00
UCLA Project (Wieland)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30,000.00	0.00	10,000.00	0.00	0.00	0.00	0.00	0.00	0.00	40,000.00
UCLA Project (Mitsubishi Shindoh)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50,000.00	0.00	0.00	0.00	0.00	0.00	0.00	75,000.00
Total	25,000.00	125,000.00	50,000.00	64,000.00	0.00	0.00	0.00	41,000.00	0.00	0.00	87,700.00	15,000.00	15,000.00	0.00	0.00	0.00	134,300.00	65,000.00	60,000.00	0.00	0.00	0.00	0.00	47,000.00	0.00	729,000.00
Expenses																										
UCLA	25,000.00	25,000.00	25,000.00	0.00	0.00	0.00	25,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	134,750.00	0.00	124,000.00	0.00	0.00	0.00	0.00	94,250.00	0.00	453,000.00
Virginia Tech	0.00	0.00	0.00	17,667.61	26,515.00	26,487.72	0.00	0.00	0.00	18,750.00	0.00	0.00	6,276.25	0.00	0.00	15,500.00	0.00	0.00	0.00	15,500.00	0.00	0.00	0.00	37,000.00	0.00	163,696.58
Labs	0.00	0.00	0.00	0.00	0.00	0.00	6,022.00	0.00	2,900.00	0.00	855.00	9,000.00	0.00	0.00	0.00	0.00	0.00	0.00	350.00	0.00	0.00	0.00	0.00	0.00	0.00	19,127.00
Japan Measuring Instruments Federation (JMIF)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6,162.00	0.00	0.00	0.00	0.00	0.00	6,162.00
CMC	0.00	0.00	0.00	6,456.52	4,182.00	2,425.50	3,113.00	2,941.00	3,373.50	2,314.00	5,162.00	2,047.00	1,913.50	759.50	2,146.00	3,196.04	4,215.54	3,910.00	2,470.00	4,745.00	4,967.47	10,450.00	5,400.00	4,515.00	6,311.85	87,014.42
Total	25,000.00	25,000.00	25,000.00	24,124.13	30,697.00	28,913.22	34,135.00	2,941.00	6,273.50	21,064.00	6,017.00	11,047.00	8,189.75	759.50	2,146.00	18,696.04	138,965.54	3,910.00	126,820.00	26,407.00	4,967.47	10,450.00	5,400.00	135,765.00	6,311.85	729,000.00
Cash Flow																										
Beginning Balance	**$0.00**	$0.00	100,000.00	125,000.00	164,875.87	134,178.87	105,265.65	71,130.65	109,189.65	102,916.15	81,852.15	163,535.15	167,488.15	174,298.40	173,538.90	171,392.90	152,696.86	148,031.32	209,121.32	142,301.32	115,894.32	110,926.85	100,476.85	95,076.85	6,311.85	
Net Revenues	0.00	100,000.00	25,000.00	39,875.87	-30,697.00	-28,913.22	-34,135.00	38,059.00	-6,273.50	-21,064.00	81,683.00	3,953.00	6,810.25	-759.50	-2,146.00	-18,696.04	-4,665.54	61,090.00	-66,820.00	-26,407.00	-4,967.47	-10,450.00	-5,400.00	-88,765.00	-6,311.85	
Ending Balance	0.00	100,000.00	125,000.00	164,875.87	$134,178.87	$105,265.65	$71,130.65	$109,189.65	$102,916.15	$81,852.15	$163,535.15	$167,488.15	$174,298.40	$173,538.90	$171,392.90	$152,696.86	$148,031.32	$209,121.32	$142,301.32	$115,894.32	$110,926.85	$100,476.85	$95,076.85	$6,311.85	**$0.00**	

Notes:

CMC received 10% (per board approval on 8/29/12) of the total $87,014.42

Breakdown of CMC's $8,701.44: $135 fees, $1000 Concast dues, $1,871.60 travel charges, $76.19 miscellaneous, $1,502.47 shipping and $4,116.18 (reflected in CMC 2017 budget as income under Industry Initiative

CMC Board of Directors Briefing
Confidential
November 13-14, 2016

Topic: UCLA Project: "Alternatives Analysis of the Viability of Lead-Free Substitutes in the Potable Water Supply System"

Board of Directors Approval: February 2, 2011 (unanimous vote)

Industry Impact: Copper-based alloys; Potable water components

Program Length: 2011-present

Project Leads:

- Dr. Peter Sinsheimer, Executive Director of the UCLA Law and Environmental Health Sustainable Technology & Policy Program.
- Dr. Marc Edwards, Virginia Tech Department of Civil and Environmental Engineering. Specializing in water treatment, corrosion, arsenic removal, applied aquatic chemistry. Named Time Magazine's *Top 100 Influential People of 2016* (Flint Water Crisis).

Cost: No funding from CMC general fund. $715,000 over 6 years (includes University(s) overhead fee). Funding sources: Chase Brass (CMC member); California Metal X (CMC Member); Concast (past CMC Member); Ingot Metal Sales (past CMC Member); Wieland (Germany); Mitsubishi Shindoh (Japan)

Background: In 2005, East Bay Municipal Utility District (EBMUD) sponsored AB 1953, which was carried by Assemblymember Wilma Chan (D-Oakland). The bill sought to lower the lead content from 8% to 0.25% in copper-based potable water components. The bill was signed into law and took effect in California on January 1, 2010. In 2011, the US brought all states into the same compliance measurement with the *Reduction of Lead in Drinking Water Act*, taking effect January 1, 2014.

Alternatives Analysis and California Law: Alternatives Analysis is a science-policy tool that has been developed specifically to provide a research framework for conducting a thorough analysis of alternatives as guidance for stakeholders to determine the extent to which an alternative to a targeted toxic (in this case lead) is viable. In 2008, California signed into law AB 1879 (Fuer-D) that creates requirements for using Alternatives Analysis in products. DTSC is the lead agency.

Facets of Alternatives Analysis: Cradle-to-cradle analysis. Includes beginning of life, chemical or element sourcing, product manufacturing, use phase, and end of life.

About UCLA Study: Based on AB 1953 and AB 1879, UCLA is creating an Alternatives Analysis template that can be used to compare any combination of copper-based alloys used to make potable water components. With a template in place, UCLA then applies the template and compares 5 lead-free alloys (bismuth and silicon based) and 2 leaded alloys, which were chosen by the project Advisory Board. Copper-based potable water components are not currently regulated by DTSC under AB 1879, but DTSC continues to expand the scope of products it regulates.

Status: After 5 years, CMC received a draft final report from UCLA in August 2016. CMC is reviewing the final draft report. After CMC review, the draft final report goes to the project Advisory Board. Comments are integrated and a final report is published.

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA
UNIVERSITY OF CALIFORNIA, LOS ANGELES
AGREEMENT NO. 20110706

This Agreement is entered into this April 25, 2011, by and between THE REGENTS OF THE UNIVERSITY OF CALIFORNIA, a California constitutional corporation, on behalf of its Los Angeles Campus, hereinafter called "University," and the California Metals Coalition, a non-profit California corporation, hereinafter called "Sponsor."

1. Statement of Work

Work under this Agreement will be performed by the University on a best efforts basis in accordance with the Statement of Work attached as Exhibit A hereof.

2. Deliverables

A final technical report to Sponsor upon conclusion of work performed hereunder will be the only deliverable under this Agreement unless additional deliverables are set forth in the Statement of Work Exhibit A hereof.

INITIAL HERE

3. Performance Period

Work under this Agreement will be performed during the period of 4/25/11 through 11/30/11

4. Cost to Sponsor

The total amount for which University will be reimbursed for the performance of work specified herein shall not exceed One Hundred thousand dollars and no cents ($100,000.00), as detailed in Exhibit B, without formal amendment of this Agreement.

5. Payment

Payments will be made to University by Sponsor in accordance with Exhibit B hereof. Checks will be made payable to The Regents of the University of California, reference Agreement No. 20110706, and will be sent to:

UCLA Administrative Main Cashier Office
Box 951432, 1125 Murphy Hall
405 Hilgard Avenue
Los Angeles, CA 90095-9000

6. Principal Investigator

University's performance hereunder will be under the direction of PETER SINSHEIMER, Principal Investigator. In the event that the Principal Investigator becomes unable or unwilling to continue work under this Agreement and an alternate Principal Investigator is not agreeable to Sponsor, Sponsor will have the option to terminate this Agreement in accordance with Article 15 hereof.

INITIAL HERE

7. Rights in Data

University will have the right to copyright, publish, disclose, disseminate and use, in whole and in part, any data and information developed or received by University under this Agreement that is not subject to the Confidentiality obligations of Article 9 hereof. Sponsor will have the right to publish and use any technical reports and information specified to be delivered hereunder, except as otherwise provided for under the terms of this Agreement. It is agreed, however, that under no circumstances will Sponsor state or imply in any publication or other published announcement that University has tested or approved any product.

8. Supplies and Equipment

In the event that University purchases supplies or equipment hereunder, title to such supplies and equipment will vest in University.

9. Confidentiality

During the course of this Agreement, Sponsor may provide University with certain information or material, including oral disclosure of information which will be reduced to writing within thirty (30) days, which Sponsor has dated and marked as "Confidential." Except as required by law, University will receive and hold such information in confidence and agrees to use reasonable effort to prevent its disclosure to third parties. This obligation will continue in effect for three (2) years after expiration or termination of the Agreement.

University will not consider information disclosed to it by Sponsor as confidential which: (1) is now public knowledge or subsequently becomes such through no breach of this Agreement; (2) is rightfully in University's possession prior to Sponsor's disclosure as shown by written records: (3) is rightfully disclosed to University by a third party; or (4) is independently developed by or for University without reliance upon confidential information received from Sponsor.

Sponsor acknowledges that University, as a public educational institution, does not have financial resources to sustain liability for disclosure of confidential information and cannot guarantee confidentiality.

10. Publication

University will have the right, at its discretion, to release information or to publish any material resulting from its performance hereunder. University will furnish Sponsor with a copy of any proposed written or oral publication (including manuscripts, abstracts, and oral presentations) at least thirty (30) days prior to submission for publication. Upon written notification by Sponsor, University agrees to delete any of Sponsor's confidential information and/or to delay publishing such proposed publication for a maximum of an additional thirty (30) days in order to protect the potential patentability of any invention described therein.

A disclaimer must appear in each publication of materials, whether copyrighted or not, based on or developed under this Agreement. This shall include, but not limited to: "This work was prepared as a result of work sponsored by the California Metals Coalition (CMC). It does not necessarily represent the views of CMC, its board, or staff. CMC, its board, staff, and subcontractors make no warranty, express or implied, and assume no legal liability for the information in this report; nor does any party represent that the use of this information will not infringe upon privately owned rights. This report or its results are not endorsed by the CMC, its board, or staff. CMC does not endorse the accuracy or adequacy of the information in this report."

11. Applicable Law

This Agreement will be governed by the laws of the State of California.

12. Notice

Whenever any notice is to be given hereunder, it will be in writing and sent to the following address:

University: The Regents of the University of California
University of California, Los Angeles
Office of Contract and Grant Administration
11000 Kinross Avenue, Suite 102
Los Angeles, California 90095-1406

Attention: Tamara S. Combs, Sr. Contract & Grant Officer

Sponsor: California Metals Coalition
2971 Warren Lane
El Dorado Hills, CA 95762

Attention: James Simonelli, Executive Director

13. Termination

Either University or Sponsor may terminate this Agreement by giving thirty (30) days written notice to the other. In the event of such termination, University will cease further obligation of project funds and will take all reasonable steps to cancel and otherwise minimize termination costs. Sponsor will pay University actual direct and indirect costs and noncancellable commitments incurred prior to the date of termination and fair close-out related costs. If the total of such costs is less than the total funds advanced, the balance will be returned to Sponsor.

14. Publicity

Neither party will use the name, trade name, trademark or other designation of the other party in connection with any products, promotion, advertising, press release, or publicity without the prior written permission of the other party.

15. Indemnification

Each party to this ~~a~~ Agreement shall indemnify, defend, and hold harmless the other, their officers, employees, representatives, and agents from and against any and all liability, loss, damages, demands, suits, judgments, expenses and costs (including attorneys fees) arising out of or in connection with this Agreement, but only in proportion to and to the extent liability, loss, damages, demands, suits, judgments, expenses and costs are caused by the indemnifying party pursuant to this Agreement.

16. Excusable Delays

University will be excused from performance hereunder if a delay is caused by inclement weather, fire, flood, strike, or other labor dispute, acts of God, acts of governmental officials or agencies, or any other cause beyond the control of University. The excusable delay is allowed for the period of time affected by the delay. If a delay occurs, the parties will revise the performance period or other provisions hereunder as appropriate.

17. Assignment

Neither party will assign its rights or duties under this Agreement to another without the prior express written consent of the other party; provided, however, that Sponsor may assign this Agreement to a successor in ownership of all or substantially all its business assets in the field to which this Agreement relates. Such successor will expressly assume in writing the obligation to perform in accordance with the terms and conditions of this Agreement. Any other purported assignment will be void.

18. Independent Contractor Status

The Sponsor and the University agree that the University and its employees are independent contractors and not employees of Sponsor. In accordance with such status, University covenants and agrees that neither it nor its employees or agents will hold

themselves out as, nor claim to be officers or employees of Sponsor by reason hereof, and that they will not by reason hereof, make any claims, demands or applications to or for any privilege applicable to an employee of the Sponsor.

19. Amendments

This Agreement with its attachments embodies the entire understanding of the parties, and there are no other agreements or understandings between the parties relating to the subject matter. This Agreement may be modified or amended only by written agreement signed by both parties.

20. Insurance Requirements:

The University is a California constitutional corporation created pursuant to Article IX, Section 9 of the California Constitution. As such, the University maintains a program of Self- Insurance for General Liability, Automobile Liability, and Employment Practices Liability. The University does not maintain primary Workers' Compensation insurance but is instead permissibly self-insured under state law pursuant to its Workers' Compensation Self Insurance Program. All reference to insurance coverage to be provided by University under this Agreement is understood and agreed by Sponsor to constitute self-insurance.

i. General Liability; comprehensive or commercial form with minimum Limits as follows:

(a)	Each Occurrence	$1,000,000,
	General Aggregate	$2,000,000
(b)	Employer Liability:-	$1,000,000

ii. Business Auto Liability: Minimum Limits for owned, non-owned, or hire automobiles with a combined single limit of not less than One Million Dollars ($1,000,000) per occurrence.

iii. Workers' Compensation: as required under California State Law.

iv. Professional liability (Errors and Omissions) minimum limits of $1,000,000 Each Claim.

v. A Certificate of Insurance shall be issued to Sponsor providing:

California Metals Coalition, their officers, employees, representatives, and agents are named as additional insured (except for professional liability and workers' compensation insurance).

University shall furnish the Sponsor with original certificate(s) evidencing coverage required, by this Agreement. All certificates are to be received and approved by the Sponsor before work commences.

21. Subcontractor Insurance:

University shall ensure that its subcontractors, or test sites, are covered by insurance of the types required in this agreement, and that the amount of insurance for each subcontractor is appropriate for that subcontractor's work. University shall not allow any subcontractor to commence work on its subcontract until the insurance has been obtained.

SPONSOR	THE REGENTS OF THE UNIVERSITY OF CALIFORNIA
By: _____ (Signature)	By: _____ (Signature)
By: James Simonelli	By: Tamara S. Combs
Title: Executive Director	Title: Sr. Contract and Grant Officer
Date: 4/25/11	Date: 5/12/11

EXHIBIT A
STATEMENT OF WORK

Project title: Alternative analysis on non-leaded alloys for public water system applications.

Objective: Technical performance comparison testing of lead-free alloys for water systems

There are four major components of this proposed project: (1) Methodology, (2) Data Collection, (3) Data Analysis, and (4) Final Report.

(1) Methodology
Methodology needs to be developed in carrying out this research study. There are ten (listed below as A-J) methodological components delineated in this project.

These tests will compare four of the most common copper based alloys currently in use in potable water applications, including municipality projects. One of the alloys included in this study contains lead levels in excess of California's AB 1953 and the new federal standard of 0.25%. This alloy is included because historically lead-based alloys represented 99% of the alloys used in the aforementioned applications. This alloy is also included because lead-based alloys continue to be used in a wide variety of non potable applications and should be compared to the "lead-free" alloys.

Because this study impacts public water system applications, major water utilities, including but not limited to Los Angeles Department of Water and Power and East Bay Municipal Utility District, will be utilized. Input from the water utilities will include key performance criteria needed to evaluate new alloys, test methods and protocols.

Details of the methodology appear in Appendix A.

A) Alloys to be tested:
i. c83600- leaded red brass
ii. c89833- no lead bismuth containing brass
iii. c87850- silicon brass (with high, nominal and low zinc content)
iv. c87600-silicon bronze

B) Fundamental and accelerated life testing (ALT) to be conducted:
i. Composition
ii. Tensile properties
iii. ISO 6509 dezincification test
iv. Pitting and weight loss
v. Underground corrosion simulation
vi. ASTM B858 stress corrosion cracking
vii. UL 1821 stress corrosion cracking

C) Coordinate with foundry to produce test samples for ALT evaluation.

D) Contact test laboratories to identify labs to conduct test for B vi.and B vii. Coordinate with chosen test labs to develop contract conditions for test. Coordinate with California Metals Coalition to procure contract to include initial composition testing of samples as well as the test protocol.

E) Compile data from the California Metals Coalition who will be contracting with laboratories to conduct tests B,ii, B,vi, and B,vii above.

F) Compile data from Virginia Tech University to conduct tests B,i, B,iii, B,iv and B,v above.

G) Develop and implement chain-of-custody data collection protocol to assure test samples provided by external parties meeting expected alloy composition and physical and mechanical properties prior to testing.

H) UCLA will be the collection point for all data and analysis. Analysis to include comparison of the validity of tests conducted in section B) with other possible tests including the University of Southern California's *Foundation for Cross-Connection Control and Hydraulic Research* Method. Analysis also to include evaluation of the 2010 TZW/Wieland Report and August 2014 TZW/Water Research Foundation (WRF) study entitled *The Performance of Nonleaded Brass Materials*. This analysis shall include:

i. Vetting report with Virginia Tech
ii. Vetting report WRF with key Advisory Board members for review
iii. Evaluating comments by other key stakeholders identified by Advisory Board members
iv. Consolidating comments and providing summary analysis, including recommendations, to water utility Advisory Board members, WRF, and study authors.
v. Engage in dialogue with water utility Advisory Board members, WRF, and study authors to clarify any issues.
vi. Incorporate final analysis and final recommendations into completing of Part L --Utility Case Studies (see below) as well as into report.
vii. Provide a summary of findings, separate from the final report, on letterhead.

I) Scientific field-based 8-year comparison on water-meter bodies made from, C89833/36, CAC902, and C87850. Work associated with this evaluation shall include, but not limited to:

i. Interview selected test laboratories in Japan certified to evaluate reliability of water meter bodies after 8 years of service about the reliability of meter bodies. Describe test methods used to determine reuse of water meter bodies, percent of meter bodies test that pass, regions serviced in Japan, number of years conducting testing, approximate percentage of meters bodies made from specific alloys, approximate total number of meter bodies tested from each alloy.
ii. Evaluate official Japanese government documents from test laboratories throughout Japan about reliability of water meter bodies after 8 years of service.
iii. Interview selected cities about reliability of water meter bodies after eight years of service by alloy composition.
iv. Identify key water quality measures associated with brass corrosion in potable water systems typically found in annual reports on water quality from public water utilities.
v. Identify annual reports on water quality throughout Japan by year, specific water utility, and specific water source.
vi. Evaluate brass corrosion potential of potable waters in Japan by water district.
vii. Develop three levels (high, medium, and low) of brass dezincification (DZ) water potential in the United States and Japan and use these as a basis for evaluating the DZ potential of specific alloys.
viii. Identify Japanese cities and/or specific water source within cities with water qualities that match high, medium, and low brass DZ waters.
ix. Contact Japanese cities with high, medium, and, low DZ prone waters about willingness to provide ECOBRASS (n=12-15) water meters and/or bismuth-based (n=12-15) water meters installed for 8 years.
x. Develop agreement with Japanese city (or cities) with high DZ prone waters for (n=12-15) water meters and/or bismuth-based (n=12-15) water meters. Develop agreement with Japanese city (or cities) with medium DZ prone waters for (n=12-15) water meters and/or bismuth-based (n=12-15) water meters.

Develop agreement with Japanese city (or cities) with low DZ prone waters for (n=12-15) water meters and/or bismuth-based (n=12-15) water meters.

xi. Develop contract with 3rd party firm with offices in Japan to coordinate with selected cities to assist with water meter procurement. This contract to include labor associated with implement procurement plan and shipping procured water meters to Virginia Tech.

xii. For each city willing to provide meters, develop specific procurement plan.

xiii. Implement procurement plan with each city and with 3rd party.

xiv. Identify United States water utilities with water quality comparable to Japanese cities and where water meter made from C89833/C89836 were installed 8 years ago.

xv. Contact targeted US water utilities about participating in study and procure sample of water meters water utilities made from C89833 or C89836 (n=12-15) and ship to Virginia Tech for testing.

xvi. Work with Virginia Tech in developing and implementing the over methodology on "In Line Service Evaluation", on developing test specific methods comparing meter body performance by alloy composition and DZ water potential based on range of key outcome measures, on reviewing data, and on analyzing data.

xvii. Include water utilities on Advisory Board in develop of methods for "In Line Service Evaluation."

xviii. Review data regarding the added use of tin (Sn) and grain refined materials in C87850.

I) Field-based product failure prevalence comparison. Work associated with this testing may include, but not limited to:

i. Determine criteria for defining product failure (e.g. removal of product from service due to manufacturing flaw in product).

ii. Coordinate with municipalities in Japan and the United States, test laboratories in Japan, and component manufacturers in Japan and US to provide failure rate data on public water supply applications based on the alloy composition, description of failure, and date applications placed into service and removed from service.

J) Resource use and production analysis. This evaluation is designed to compare the resource and costs associated with the production of components used in the public water supply system. This evaluation may include, but not limited to:

i. Data collected from the prior phase of this project.

ii. Survey of foundries in the United States, Japan, and Germany pouring cast applications using one or more of the alloys identified in A,i-A,iv above. The survey may include, but not limited to, the follow factors:
   a. Metal yield.
   b. Manufacturing through-put time.
   c. Fume generation.
   d. Slag/dross generation.
   e. Energy used during the manufacturing process.
   f. Total cost per application.

iii. Foundries to include both businesses making public water supply applications (e.g. water meters, fire hydrants) as well as potable water components primarily purchased by private sector uses (e.g. faucets).

K) Product life-cycle comparison evaluation. This evaluation is designed to compare impacts throughout the life-cycle of the product including resource extraction, product manufacturing, product use, and end-of-life reuse. These evaluations may include, but not limited to:

i. Life-cycle environmental impact comparative analysis.

ii. Life-cycle human health impact comparative analysis.

iii. Life-cycle energy use comparative analysis.

iv. Life-cycle economic impact comparative analysis. Because one of the alloy compositions in this analysis is covered by a patent (C87850), the economic impact analysis will incorporate an assessment of royalty fees.
v. Complete analysis of beginning-of-life as well as end-of-life consequences of a switch from lead-bearing to each of the lead-free alloys with respect to recyclability, energy impact, environmental impact, human health impact, and economic impact.

L) Utility Case Studies. Evaluate decision making criteria used by two Advisory Board utilities in evaluating whether to allow use of lead-free copper-based alloys for casted public water supply applications.

M) Alternatives Analysis. This analysis will first develop an alternatives assessment matrix which compiles data collected on technical performance, economic cost, environmental impact, and human health impact for each alloy. This matrix will then be used to identify key trade-offs between alternatives and determine the overall viability of alternatives.

A Stakeholder Advisory Panel will be developed to review the test methodology and protocols. The Advisory Panel will consist of a range of stakeholders. The Advisory Panel will also read and comment on the final draft report.

(2) Data Collection

Data for this study will be collected from a variety of sources. These sources may include, but not limited to: foundries manufacturing test materials, laboratories conducting technical performance testing, municipalities providing in-service potable water applications and field-based product failure rates, life-cycle software programs compiling environmental impact statistics, as well as other secondary sources. UCLA will be the repository for all data.

(3) Data Analysis

After data is collected, it will be analyzed according to Methodology Development phase of this project. In general, the following protocol will be followed. First, data collected will be organized by alloy and by each measure. Second, for each alloy and measure, the raw data will be standardized. Third, an alternatives assessment matrix will be developed comparing each alloy for each standardized measure. Fourth, for each standardized measure, differences between alloys will be calculated. In addition, any uncertainties associated with data will be characterized. Finally, Phase II results will be compared with other methods used to characterize the reliability of using copper-based alloys in public water supply systems.

(4) Final Report

A final report will be created and contain at a minimum: 1) objective; 2) methodology; 3) presentation of accelerated life testing data; 4) analysis of in-service component performance; 5) life cycle comparison; 6) alternatives analysis; 7) Phase 1 cost analysis and conclusions; and 8) Phase II conclusions. A draft report will be presented at a meeting of the Stakeholder Advisory Panel. Where appropriate, changes to the report will be made based on comments received. A final report will be submitted to California Metal Coalition. An additional user-friendly version of the final report will be produced designed to make the finding understandable to a broad range of stakeholders, including the general public.

(5) Outreach

Outreach includes all stakeholder outreach prior to the completion of the final report associated with communicating substantive research findings beyond what was previously included in the contract.

This shall include, but not limited to:

- Conference presentation(s) recommended by Advisory Board members, and approved by the California Metals Coalition. Travel costs outside of California may be reimbursed, upon approval.
- Provide a summary of options for outreach 12 months beyond the publication of the final report. This will include cost estimates for time and travel reimbursement.
- Holding an interim Stakeholder Advisory Board meeting on July 23, 2015, and responding to questions.
- Production of an interim report of preliminary findings by September 30, 2015.
- Upon approval by the California Metals Coalition, presentation and/or discussion of preliminary findings with media, individual stakeholders, and/or Advisory Board members. Travel costs outside of California may be reimbursed, upon approval.
- Discussion of consequences of preliminary findings with individual stakeholders (e.g. development of type approvals for all classes of components, development of procurement policy analysis based on findings)
- Provide a draft final report, with or without completed data from the 8-year field based study in subsection I, by December 15, 2015. The draft final report will be formatted and delivered based on the parameters in section 4.

EXHIBIT B
PAYMENT SCHEDULE

Budget		
Phase I	6.30.2012	$75,000
Phase II Deliverables	**Estimated Completion Date**	**Amount**
(1) Develop Methodology	7.30.2012	$25,000
(1b) Additional Methodology	2.1.2015	$20,000
(2) Data Collection	9.30.2015	$135,000
(3) Data Analysis	11.30.2015	$120,000
(4) Final Report	12.31.2015	**$**48,000
(5) Outreach	12.31.2015	$20,000
(5b) Outreach – Interim Report	9.31.2015	$10,000
*54% indirect cost has been embedded in the deliverables costs		
TOTAL COST		$378,000

Appendix A

Test Name	Test Description	Test Standard	# Alloys (3)	Zinc Levels (L/M/H)	# Samples / Alloy	Total # Samples	Test Lab
Alloy composition	Major and residual elements	ICP/ICP-MS	4	1@3(2), 3@1	3	18	Virginia Tech
Dezincification	Dezincification resistance	ISO 6509	4	1@3, 3@1	3	18	
Pitting & weight loss	Chlorinated, high pH water	Virginia Tech	4	1@3, 3@1	3	18	
Underground corrosion & weight loss	Sulfides in water/soil	Virginia Tech	4	1@3, 3@1	3	18	
Tensile properties	Tensile, yield, elongation	ASTM E8	4	1@3, 3@1	3	18	NSL, Cleveland OH
Stress corrosion cracking	Unstressed SCC	ASTM B858	4	1@3, 3@1	3	18	DNV, Columbus OH

(1) Stressed to 25%, 50% and 75% of yield strength
(2) C87850 will be cast with three chemistry variations (see Table 2 below). That was not considered necessary for the other alloys since they have lower zinc contents.
(3) C87600 target analysis: 90.5 – 91.5Cu, 4-5Si, 4-5Zn

Sequence of Events

1. Ingot is supplied to foundry for sand casting ASTM B208 tensile bars. Ingots of each alloy will be the nominal chemistry supplied to the industry except as shown below for C87850 and the analysis for C87600 in footnote 3 above which covers both C87600 and C87610 specifications.
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Table 2: C87850 Zinc Variation

Sample	Cu (%)	Si (%)	P (%)	Zn (approx. %)
1	73.5	3	0.1	23.4
2	76	3	0.1	20.9
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5. Pour the number of tensile bars shown in Table 3, cut off bars, save the rigging, mark all pieces with alloy number and prepare machining.
6. Ship machined samples to NSL for tensile testing, Virginia Tech for corrosion testing and DNV for stress corrosion cracking testing.

7. Using the tensile test results, work with DNV to determine the torque loads for the ASTM G37 tests.

Table 3: Tensile Bar Count per Alloy

	Sample From	C836	C876	C87850			C89833	Notes
				Lo Zn	Med Zn	Hi Zn		
Alloy composition	Chill Disc	3	3	3	3	3	3	5/22 E-mail from Marc Edwards stated 3 feet is required for each alloy. ASTM B208 tensile bars length = 6”
Dezincification	B208	2	2	2	2	2	2	
Pitting & weight loss	B208	2	2	2	2	2	2	
Underground corrosion & weight loss	B208	2	2	2	2	2	2	
Tensile properties	B208	3	3	3	3	3	3	
SCC – B858	B208	3	3	3	3	3	3	Suggest machining tensile bars to introduce some stress and clean up surface
SCC – G37	B208	3	3	3	3	3	3	Thread each end and test. Need to determine thread dimensions.
		3	3	3	3	3	3	Extra tensile bars for reruns of experiments
Total per alloy		21	21	21	21	21	21	

VirginiaTech

Technical Assistance Program Agreement
www.tap.vt.edu

UNIVERSITY	COMPANY
Virginia Polytechnic Institute and State University ("Virginia Tech") Continuing and Professional Education 702 University City Blvd. (0364) Blacksburg, VA 24061 Phone: (540) 231-7887 Fax: (540) 231-9886 Price: $ 23,995.18 Performance Period: 7/7/2012 To 11/30/2012 Program Number: 565389 Primary Virginia Tech Faculty Contact: Marc Edwards Make Checks Payable to: **Treasurer of Virginia Tech**	Contact Name: James Simonelli Contact Title: Company Name: California Metals Coalition Address: 2971 Warren Lane El Dorado Hills, CA 95762 Phone: 916-933-3075 Fax: 916-933-3072 Email: james@metalscoalition.com Send Invoice To: *(if different than above address)* Address:

TERMS AND CONDITIONS

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8. **Publicity.** Either party may identify the parties to this Agreement, title of the Project, and price. Any other use of the name of the other party in any publicity, advertising, or news releases requires the prior written approval of the authorized representative of the other party. Notwithstanding the foregoing approval requirement, a disclaimer must appear in each publication of materials by Virginia Tech, whether copyrighted or not, based on or developed under this Agreement. This disclaimer shall include: *"This work was prepared as a result of work sponsored by the California Metals Coalition (CMC). It does not necessarily represent the views of CMC, its board, or staff. CMC, its board, staff, and subcontractors make no warranty, express or implied, and assume no legal liability for the information in this report; nor does any party represent that the use of this information will not infringe upon privately owned rights. This report or its results are not endorsed by the CMC, its board, or staff. CMC does not endorse the accuracy or adequacy of the information in this report.*
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ENDORSEMENTS

UNIVERSITY	COMPANY
Scott Weimer — Date: 7/12/12 Director, Continuing and Professional Education	James Simonelli — Date: 7/11/12

PARTICIPATING FACULTY, STAFF, & STUDENTS

Participating Faculty: Marc Edwards, Charles Lunsford Professor, Civil & Environmental Engineering

REQUIRED SERVICES SCOPE OF WORK & DELIVERABLES

Required Services (Scope of Work)

Project title: Alternative analysis on non-leaded alloys for public water system applications.

Objective: Technical performance comparison testing of lead-free alloys for water systems

Details of the methodology appear in Appendix A.

A) Brass alloys to be tested:

i. c83600- leaded red brass
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i. **Composition**
ii. Tensile properties
iii. **ISO 6509 dezincification test**
iv. **Pitting and weight loss**
v. **Underground corrosion simulation**
vi. ASTM B858 stress corrosion cracking
vii. ASTM G37 stress corrosion cracking

Details in terms of numbers of tests are indicated in the Table below.

ENDORSEMENTS

UNIVERSITY	COMPANY
Scott Weimer — Date: 7/12/12 Director, Continuing and Professional Education	James Simonelli — Date: 7/11/12

Appendix A

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		3	3	3	3	3	3	Extra tensile bars for reruns of experiments
Total per alloy		21	21	21	21	21	21	

PAYMENT AND RATE SCHEDULE

	Percentage	Amount
Total Project Cost		$23,995.18
Due by July 23, 2012	25%	$5,998.80
Due by October 31, 2012	50%	$11,997.60
Final Billing at Conclusion of Project	25%	$5,998.80

USE / COST OF UNIVERSITY FACILITIES

VirginiaTech

Technical Assistance Program Agreement
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UNIVERSITY	COMPANY
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ENDORSEMENTS

UNIVERSITY	COMPANY
Scott Weimer — Date: 8/6/12	James Simonelli — Date: 8-2-12
Director, Continuing and Professional Education	

PARTICIPATING FACULTY, STAFF, & STUDENTS

Participating Faculty: Dr. Emily Sarver, Assistant Professor, Mining and Minerals Engineering

REQUIRED SERVICES SCOPE OF WORK & DELIVERABLES

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Total per alloy		21	21	21	21	21	21	

PAYMENT AND RATE SCHEDULE

	Percentage	Amount
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Due by September 1, 2012	25%	$5,959.12
Due by October 31, 2012	50%	$11,918.24
Final Billing at Conclusion of Project	25%	$5,959.12

USE / COST OF UNIVERSITY FACILITIES

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Technical Assistance Program Agreement

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UNIVERSITY	COMPANY
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8. **Publicity.** Either party may identify the parties to this Agreement, title of the Project, and price. Any other use of the name of the other party in any publicity, advertising, or news releases requires the prior written approval of the authorized representative of the other party. Notwithstanding the foregoing approval requirement, a disclaimer must appear in each publication of materials by Virginia Tech, whether copyrighted or not, based on or developed under this Agreement. This disclaimer shall include: *"This work was prepared as a result of work sponsored by the California Metals Coalition (CMC). It does not necessarily represent the views of CMC, its board, or staff. CMC, its board, staff, and subcontractors make no warranty, express or implied, and assume no legal liability for the information in this report; nor does any party represent that the use of this information will not infringe upon privately owned rights. This report or its results are not endorsed by the CMC, its board, or staff. CMC does not endorse the accuracy or adequacy of the information in this report.*
9. **Export Controls.** It is understood that both parties are subject to U.S. laws and regulations controlling the export of certain items, commodities, defense articles, Confidential Information, proprietary technical data or source code, collectively hereafter referred to as "Items." Each party is obligated to comply with applicable U.S. export laws and regulations (including the Arms Export Control Act, as amended, and the Export Administration Act of 1979). Prior to providing any Items which are subject to U.S. export laws and regulations, and prior to furnishing any Items where oral instruction or inspection may disclose technical data subject to such export controls, the disclosing party shall notify receiving party's contracting officer in writing of the Items and applicable export controls. Receiving party shall have the right to decline or limit the receipt of such Items, and any task requiring receipt of such Items. The transfer of Items may require a license from the cognizant agency of the U.S. government. The parties agree to cooperate in securing any license which the cognizant agency deems necessary in connection with this Agreement.
10. **Governing Law.** This contract will be governed by the laws of the Commonwealth of Virginia, without regard to conflict of laws.
11. **Termination.** Either party may terminate the Project upon thirty (30) days' prior written notice to the other. Project results to the date of termination shall be provided to Company. All reasonable costs and non-cancelable obligations incurred by University up to the time of said termination shall be reimbursed by Company. University shall return any prepayment by Company in excess of such reimbursable amounts. At the request of Company, all unused Company provided materials at the time of termination shall either be destroyed by University or returned to Company.
12. **Best efforts.** University will use its best efforts to perform the Project. Project results are provided "as-is", and neither the Primary Virginia Tech Faculty Member nor University makes no representations or warranties, expressed or implied, in regard to the services rendered, Project deliverables or the Project results. Company agrees to indemnify and hold harmless University against any claims arising out of Company's use, commercial sale, or distribution of Project deliverables or results.
13. **Entire Agreement.** This contract contains the entire and only agreement between the University and Company respecting the Project and supersedes or cancels all previous negotiations, agreements, commitments and writings between the parties on the Project. This Agreement may only be amended in writing signed by the duly authorized representatives of each of the parties. ***By signing this Agreement, Company acknowledges that this Agreement supersedes and replaces any terms and conditions of Purchase Order or other financial document(s) used to make payment(s).***

ENDORSEMENTS

UNIVERSITY	COMPANY
Scott Weimer Director, Continuing and Professional Education	James Simonelli
Date: 8/6/12	Date: 8-2-12

PARTICIPATING FACULTY, STAFF, & STUDENTS

Participating Faculty: Dr. Simoni Triantafyllidou, Postdoctoral Associate, Civil & Environmental Engineering

REQUIRED SERVICES SCOPE OF WORK & DELIVERABLES

Required Services (Scope of Work)

Project title: Alternative analysis on non-leaded alloys for public water system applications.

Objective: Technical performance comparison testing of lead-free alloys for water systems

Details of the methodology appear in Appendix A.

A) Brass alloys to be tested:

i. c83600- leaded red brass
ii. c89833- no lead bismuth containing brass
iii. c87850- silicon brass (with high, nominal and low zinc content)
iv. c87600-silicon bronze

B) Fundamental and accelerated life testing (ALT) to be conducted (bold are to be conducted at Virginia Tech):

i. **Composition**
ii. Tensile properties
iii. **ISO 6509 dezincification test**
iv. **Pitting and weight loss**
v. **Underground corrosion simulation**
vi. ASTM B858 stress corrosion cracking
vii. ASTM G37 stress corrosion cracking

Details in terms of numbers of tests are indicated in the Table below.

Appendix A

Test Name	Test Description	Test Standard	# Alloys (3)	Zinc Levels (L/M/H)	# Samples / Alloy	Total # Samples	Test Lab
Alloy composition	Major and residual elements	ICP/ICP-MS	4	1@3(2), 3@1	3	18	Virginia Tech
Dezincification	Dezincification resistance	ISO 6509	4	1@3, 3@1	3	18	
Pitting & weight loss	Chlorinated, high pH water	Virginia Tech	4	1@3, 3@1	3	18	
Underground corrosion & weight loss	Sulfides in water/soil	Virginia Tech	4	1@3, 3@1	3	18	
Tensile properties	Tensile, yield, elongation	ASTM E8	4	1@3, 3@1	3	18	NSL, Cleveland OH
Stress corrosion cracking	Unstressed SCC	ASTM B858	4	1@3, 3@1	3	18	DNV, Columbus OH
Stress corrosion cracking	Stressed SCC resistance (1)	ASTM G37	4	1@3, 3@1	3	18	

(1) Stressed to 25%, 50% and 75% of yield strength

(2) C87850 will be cast with three chemistry variations (see Table 2 below). That was not considered necessary for the other alloys since they have lower zinc contents.

(3) C87600 target analysis: 90.5 – 91.5Cu, 4-5Si, 4-5Zn

Sequence of Events

1. Ingot is supplied to foundry for sand casting ASTM B208 tensile bars. Ingots of each alloy will be the nominal chemistry supplied to the industry except as shown below for C87850 and the analysis for C87600 in footnote 3 above which covers both C87600 and C87610 specifications.
2. Foundry will mix C87850 with copper or zinc ingot to create three different zinc levels. No other alloys will be tested with varying zinc content. Tolerance for the zinc content targets is +/- 0.25%.

Table 2: C87850 Zinc Variation

Sample	Cu (%)	Si (%)	P (%)	Zn (approx. %)
1	73.5	3	0.1	23.4
2	76	3	0.1	20.9
3	77.5	3	0.1	19.4

3. Pouring temperature will be determined for each alloy
4. Cast three (3) sets of chill discs per alloy and send to Chase to forward to Virginia Tech, Ingot Metals and an independent lab if necessary
5. Pour the number of tensile bars shown in Table 3, cut off bars, save the rigging, mark all pieces with alloy number and send bars to Chase for machining.
6. Chase will ship machined samples to NSL for tensile testing, Virginia Tech for corrosion testing and DNV for stress corrosion cracking testing.

7. Using the tensile test results, Chase will work with DNV to determine the torque loads for the ASTM G37 tests.

Table 3: Tensile Bar Count per Alloy

	Sample From	C836	C876	C87850			C89833	Notes
				Lo Zn	Med Zn	Hi Zn		
Alloy composition	Chill Disc	3	3	3	3	3	3	5/22 E-mail from Marc Edwards stated 3 feet is required for each alloy. ASTM B208 tensile bars length = 6"
Dezincification	B208	2	2	2	2	2	2	
Pitting & weight loss	B208	2	2	2	2	2	2	
Underground corrosion & weight loss	B208	2	2	2	2	2	2	
Tensile properties	B208	3	3	3	3	3	3	
SCC – B858	B208	3	3	3	3	3	3	Suggest machining tensile bars to introduce some stress and clean up surface
SCC – G37	B208	3	3	3	3	3	3	Thread each end and test. Need to determine thread dimensions.
		3	3	3	3	3	3	Extra tensile bars for reruns of experiments
Total per alloy		21	21	21	21	21	21	

PAYMENT AND RATE SCHEDULE

	Percentage	Amount
Total Project Cost		$22,838.74
Due by September 30, 2012	25%	$5,709.69
Due by October 31, 2012	50%	$11,419.37
Final Billing at Conclusion of Project	25%	$5,709.69

USE / COST OF UNIVERSITY FACILITIES

VirginiaTech

Technical Assistance Program Agreement

www.tap.vt.edu

UNIVERSITY	COMPANY
Virginia Polytechnic Institute and State University ("Virginia Tech") Continuing and Professional Education 702 University City Blvd. (0364) Blacksburg, VA 24061 Phone: (540) 231-7887 Fax: (540) 231-9886 Price: $ 25,000 Performance Period: 1/1/2013 To 4/1/2013 Program Number: 565525 Primary Virginia Tech Faculty Contact: Emily Sarver Make Checks Payable to: **Treasurer of Virginia Tech**	Contact Name: James Simonelli Contact Title: Company Name: California Metals Coalition Address: 2971 Warren Lane El Dorado Hills, CA 95762 Phone: 916-933-3075 Fax: 916-933-3072 Email: james@metalscoalition.com Send Invoice To: *(if different than above address)* Address:

TERMS AND CONDITIONS

1. **Project.** University will perform the services and provide the deliverables as specified in the proposal, attached as Attachments A-B, under the direction of the above-referenced Primary Virginia Tech Faculty Contact.
2. **Payment Schedule.** Company will pay University the fixed price indicated above in accordance with the following schedule: **25%** of total due January 1, 2013, **50%** at the midway point of the Project, and **25%** upon completion of the Project.
3. **Federal Funding.** ***Company certifies no federal or federal flow-through funds will be used to pay for this Project.***
4. **Deliverables.** Deliverable(s) shall be the property of the Company.
5. **Confidential Information.** University shall use Confidential Information provided by Company only for the purposes of the Project. University agrees to use the same degree of care as it uses to protect its own Confidential Information and to maintain the confidentiality of the information for a period of five (5) years from the date of receipt by the Primary Virginia Tech Faculty Contact referred to above. Confidential Information must be provided in writing and labeled as confidential, or identified as confidential at the time of visual or oral disclosure and reduced to writing and transmitted to University within 30 days of such non-written disclosure. University's obligations do not apply to Confidential Information that is, in the public domain, independently known, independently developed or obtained by University, or required by law or regulation to be disclosed.
6. **Intellectual Property.** The parties agree that no intellectual property shall be requested or developed under this Agreement. In the event intellectual property is developed, it shall belong exclusively to Virginia Tech. If it becomes apparent that the work is leading to an intellectual property, the Company and the Primary Virginia Tech Faculty Member shall disclose this to Virginia Tech for review and consideration. No product development or prototype creation shall be required under this Agreement.
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UNIVERSITY	COMPANY
Scott Weimer **Date** Director, Continuing and Professional Education	**James Simonelli** **Date** 12-20-12

PARTICIPATING FACULTY, STAFF, & STUDENTS

Participating Faculty: Marc Edwards, Charles Lunsford Professor, Civil & Environmental Engineering

REQUIRED SERVICES SCOPE OF WORK & DELIVERABLES

EXHIBIT A
STATEMENT OF WORK (update effective 12/12/2012)

Project title: Alternative analysis on non-leaded alloys for public water system applications
(adding a fourth test indicated in red text under item C, below, and a new budget for $25,000)

Objective: Technical performance comparison testing of lead-free alloys for water systems

Details of the methodology appear in Appendix A. New phase of Step C work described in Appendix B.

A) Brass alloys to be tested:

i. c83600- leaded red brass
ii. c89833- no lead bismuth containing brass
iii. c87850- silicon brass (with high, nominal and low zinc content)
iv. c87600-silicon bronze

B) Fundamental and accelerated life testing (ALT) to be conducted (bold are to be conducted at Virginia Tech):

i. **Composition**
ii. Tensile properties
iii. **ISO 6509 dezincification test**
iv. **Pitting and weight loss**
v. **Underground corrosion simulation**
vi. ASTM B858 stress corrosion cracking
vii. ASTM G37 stress corrosion cracking

C) QA/QC Pre-testing, Maintain Chain of Custody, Assist in Evaluation of USC protocol

Three Technical Assistance Program (TAP) contracts will be involved.
1) Dr. Marc Edwards, Composition and Pitting/Weight Loss. $23,800.
2) Dr. Simoni Triantafyllidou, Underground Corrosion Simulation. $23,800.
3) Dr. Emily Sarver. ISO 6509 Dezincification Test. $20,780.

Details in terms of numbers of tests are indicated in the Table below.

Appendix A

Test Name	Test Description	Test Standard	# Alloys (3)	Zinc Levels (L/M/H)	# Samples / Alloy	Total # Samples	Test Lab
Alloy composition	Major and residual elements	ICP/ICP-MS	4	1@3[(2)], 3@1	3	18	Virginia Tech
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Stress corrosion cracking	Stressed SCC resistance [(1)]	ASTM G37	4	1@3, 3@1	3	18	

(1) Stressed to 25%, 50% and 75% of yield strength
(2) C87850 will be cast with three chemistry variations (see Table 2 below). That was not considered necessary for the other alloys since they have lower zinc contents.
(3) C87600 target analysis: 90.5 – 91.5Cu, 4-5Si, 4-5Zn

Sequence of Events

1. Ingot is supplied to foundry for sand casting ASTM B208 tensile bars. Ingots of each alloy will be the nominal chemistry supplied to the industry except as shown below for C87850 and the analysis for C87600 in footnote 3 above which covers both C87600 and C87610 specifications.
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Table 2: C87850 Zinc Variation

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2	76	3	0.1	20.9
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3. Pouring temperature will be determined for each alloy
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7. Using the tensile test results, Chase will work with DNV to determine the torque loads for the ASTM G37 tests.

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	Sample From	C836	C876	C87850			C89833	Notes
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Tensile properties	B208	3	3	3	3	3	3	
SCC – B858	B208	3	3	3	3	3	3	Suggest machining tensile bars to introduce some stress and clean up surface
SCC – G37	B208	3	3	3	3	3	3	Thread each end and test. Need to determine thread dimensions.
		3	3	3	3	3	3	Extra tensile bars for reruns of experiments
Total per alloy		21	21	21	21	21	21	

Appendix B. QA/QC Pre-testing, Maintain Chain of Custody, Assist in Evaluation of USC protocol

QA/QC Pre-testing: Over 1 month of experiments was conducted on the earlier scope of TAP work. During the conduct of that work it was discovered that the samples provided to Virginia Tec were not optimal. A decision was jointly made to abandon that phase of testing and to consider the experience to be QA/QC pre-testing. Specifically, some lessons were learned during that portion of work that could improve the analysis originally intended, but using optimal test samples that will be provided to Virginia Tech.

Maintain Chain of Custody. Amongst the issues realized was that Virginia Tech should be the contact point for distribution of samples. A chain of custody was prepared which spelled out the test sequence in detail. This chain of custody is at the end of Appendix B.

Assist in Evaluation of USC Protocol. UCLA will take the lead in obtaining documents associated with an earlier dezincification test protocol. Those documents will be shared with Virginia Tech, and Dr. Edwards and Dr. Sarver will assist in evaluating the strengths and weaknesses of the USC protocol.

PAYMENT AND RATE SCHEDULE

	Percentage	Amount
Total Project Cost		$25,000
Due by January 1, 2013	25%	$6,250
Due by March 1, 2013	50%	$12,500
Final Billing at Conclusion of Project	25%	$6,250

USE / COST OF UNIVERSITY FACILITIES

Choose an item.

FIXED PRICE RESEARCH AGREEMENT

UNIVERSITY

Virginia Polytechnic Institute and State University
Office of Sponsored Programs
North End Center, 300 Turner Street, Suite 4200
Blacksburg, VA 24061
Phone: (540) 231-5281
Fax: (540) 231-3599

COMPANY

Name: California Metals Coalition
Address: 2971 Warren Lane
El Dorado Hills, CA 95762

Phone: 916-933-3075 Fax: 916-933-3072
Email: james@metalscoalition.com
Send Invoice To: James Simonelli ***(if different than above address)*** Address:

Price: $62,000.00 Performance Period: 02/15/15 to 08/15/15

Virginia Tech Proposal Number: 15-1732-02

Principal Investigator: Marc Edwards

Make Checks Payable to: **Treasurer of Virginia Tech**

TERMS AND CONDITIONS

1. **Project.** University will perform the services and provide the deliverables as specified in the Statement of Work for the above-referenced proposal, attached as Exhibit A, under the direction of the above-referenced Principal Investigator.
2. **Payment Schedule.** Company will pay University the fixed price indicated above in accordance with the following schedule: 25% up front and then equal quarterly payments. ***No federal funds shall be used for payment under this contract.***
3. **Deliverable.** Deliverable(s) shall be the property of the Company.
4. **Publication.** University will be free to publish the Project results after providing Company with a forty-five (45) day period in which to review each publication to identify patentable subject matter and to identify any inadvertent disclosure of the Company's Confidential Information. Any extension of this review time will require the written consent of the Principal Investigator.
5. **Confidential Information.** University shall use Confidential Information provided by Company only for the purposes of the Project. University agrees to use the same degree of care as it uses to protect its own Confidential Information and to maintain the confidentiality of the information for a period of five (5) years from the date of receipt by the Principal Investigator referred to above. Confidential Information must be provided in writing and labeled as confidential, or identified as confidential at the time of visual or oral disclosure and reduced to writing and transmitted to University within 30 days of such non-written disclosure. University's obligations do not apply to Confidential Information that is, in the public domain, independently known, independently developed or obtained, by University, or required by law or regulation to be disclosed.
6. **Intellectual Property.** Company shall own all reports, copyrighted works, and inventions created under the Project. University shall have the right to use all such intellectual property for non-commercial research and educational purposes. The University would cooperate with the Company, at Company's expense, if any patents are filed by the Company on the results.
7. **University Status**. University shall be deemed to be and shall be an independent contractor in its activities under this Agreement.
8. **Publicity.** Either party may identify the parties to this Agreement, title of the Project, and price. Any other use of the name of the other party in any publicity, advertising, or news releases requires the prior written approval of the authorized representative of the other party.
9. **Export Controls.** University and Company are subject to United States laws and regulations controlling the export of technical data, computer software, laboratory prototypes and other commodities, must comply with applicable U.S. export laws and regulations (including the Arms Export Control Act, as amended, and the Export Administration Act of 1979). The transfer of certain technical data and commodities may require a license from the cognizant agency of the United States Government.
10. **Disputes.** The parties will mutually agree on dispute resolution procedures. This contract will be governed by the laws of the Commonwealth of Virginia, without regard to conflict of laws.
11. **Termination.** Either party may terminate the Project upon thirty (30) days prior written notice to the other. Project results to the date of termination shall be provided to Company. All reasonable costs and non-cancelable obligations incurred by University up to the time of said termination shall be reimbursed by Company. University shall return any prepayment by Company in excess of such reimbursable amounts. At the request of Company, all unused Company provided materials at the time of termination shall either be destroyed by University or returned to Company.
12. **Best efforts.** University will use its best efforts to perform the Project. Project results are provided "as-is", and University makes no representations or warranties, expressed or implied, in regard to the quality of the services, Project deliverables or the Project results. Company agrees to indemnify and hold harmless University against any claims arising out of Company's use, commercial sale, or distribution of Project results.
13. **Equipment.** Title and ownership of any equipment purchased under this Agreement shall vest in Virginia Tech.
14. **Federal Funds.** The terms and conditions of this contract are contingent on there being no federal funds used for payment under this contract. Should federal funds be used, ownership of, and rights to, data, deliverables, and inventions shall be in accordance with applicable government regulations.
15. **Entire Agreement.** This contract contains the entire and only agreement between University and Company respecting the Project and supersedes or cancels all previous negotiations, agreements, commitments and writings between the parties on the Project. This Agreement may only be amended in writing signed by the duly authorized representatives of each of the parties. ***By signing this Agreement, Company acknowledges that this Agreement supersedes and replaces any terms and conditions of Purchase Order or other financial document(s) used to make payment(s).***

ENDORSEMENTS

UNIVERSITY

John C Rudd April 21, 2015

John C. Rudd Date
Assistant Vice President for Sponsored Programs Administration

COMPANY

Name: James Simonelli Date 4.21.15
Title: Executive Director
Tax ID# 95-4609615:

Exhibit A

Proposal

Up to 70 water meters will be collected by UCLA and sent to Virginia Tech for forensic analysis of corrosion pattern, damage and lifetime estimate. The meters will be collected from Los Angeles and Japanese cites. Virginia Tech will cut open each meter, photograph it, inspect it for dezincification damage, and at the point(s) of maximum attack (if any), determine the wall thickness that is damaged and estimate the lifetime of service that is remaining. Techniques to be used are visual inspect, XRF, and SEM ESCA. Virginia Tech will then prepare a document with an appendix of photo's, summary tables of key results, and an overview of non-uniform and/or dezincification damage at each location (see steps in red in Table below).

Protocol for Service-Line Evaluation of Water Meters in Three Dezincification-Prone Waters

Development of Specific Methods and Implementation of Data Collection and Data Analysis Plan		
Work with Virginia Tech		
Work with water utilities on the Advisory Board (i.e., LADWP, East Bay MUD)		
Water Meter Sampling		
DZ Waters	High DZ	Chloride (mg/L)/Total Hardness (as $CaCO_3$) (mg/L) = Highest possible ratio
		Chloride ≈50mg/L or Total Hardness (as $CaCO_3$) ≈102mg/L (LADWP)
		pH = 7.2-7.9 (The higher the better)
	Moderate DZ	Chloride (50mg/L)/Total Hardness (as $CaCO_3$) (102mg/L) ≈ 0.5
		Chloride ≈50mg/L or Total Hardness (as $CaCO_3$) ≈102mg/L (LADWP)
		pH ≈ 7.5
	Low DZ	Chloride (mg)/Hardness (mg) ≈ 0.2
		Chloride ≈50mg/L or Total Hardness (as $CaCO_3$) ≈102mg/L (LADWP)
		pH ≈ 7.5
Exposure period	8 yrs	Japan = Use year meter manufactured to control Los Angeles = Use records to show date meter installed
Validation of Exposure	Match meter clock	Determine typical range/yr
Water meter size	Japan	13mm preference 20mm as backup
	Los Angeles	5/8" preference -- as match to Japan 1" backup to 20mm Japan
Alloy/DZ Level/City	High DZ	Japanese city: ECOBRASS (E) Same Japanese city as ECOBRASS: Bi-Brass (B)
	Moderate DZ	Japanese city: ECOBRASS Same Japanese city as ECOBRASS: Bi-Brass Los Angeles: Bi-Brass
	Low DZ	Japanese city: ECOBRASS Same Japanese city as ECOBRASS: Bi-Brass
Sample Size	High DZ	Japanese city: ECOBRASS = 10 Same Japanese city as ECOBRASS: Bi-Brass = 10
	Moderate DZ	Japanese city: ECOBRASS = 10 Same Japanese city as ECOBRASS: Bi-Brass = 10 Los Angeles: Bi-Brass = 10

	Low DZ	Japanese city: ECOBRASS = 10 Same Japanese city as ECOBRASS: Bi-Brass = 10

Meter Collection Protocol	
ID Japanese cities with DZ water quality fit	
Assess whether potential cities installed both E and B meters 8 yr ago	
Contact screened cities about participating	STPP cover letter
	LADWP letter
	JWWA contact
	Water meter manufacture or alloy manufacture contact
City participation requirements	Provide UCLA water meters recently removed from service made from either ECOBRASS and/or Bi-Brass
	Preference for 13mm meters in Japan and 5/8" meters in US
	For each alloy provide 12+ meters
	Agree to screen meters to identify specific meters with similar amount of used based on meter clock reading
	Develop specific protocol for obtaining meters
	Work with 3rd party firm or UCLA to select meters to be provided
	Sign MOU with UCLA for protocol for obtaining meters
3rd party firm component procurement	Travel to each city to procedure meters
	Work with each city utility contact on implementing protocol for obtaining meters
	Protocol may include Skype with UCLA during sample selection process
	Ship meters to Virginia Tech
	Develop 1 or more contracts with UCLA to cover the cities selected
Data Collection and Analysis Protocol (Virginia Tech)	
Develop unique identifier for each meter	Identifier to specify alloy composition, city were meter installed, meter clock reading
Cutting each meter	
Visual inspection for: (1) Erosion corrosion, (2) Dezincification corrosion (3) non-uniform corrosion	Photograph each sectioned meter
	On each photo, show location where corrosion observed and type of corrosion
	Calculate percent meters with visible corrosion by corrosion type, specific

	alloy and DZ water level
	Within each corrosion type analyze trend in percent visible corrosion for each alloy by increasing DZ water level
	Within each corrosion type, analyze differences between alloys in percent of meters with visible corrosion by type of corrosion and DZ water level
Measurement of max DZ depth	Based on visual inspection, for each meter with visible DZ corrosion, identify location worst case DZ corrosion
	Take SEM photo at maximize depth location
	Quantify maximum depth if non-uniform corrosion has occurred.
Verification of DZ	Take XRF composition reading at location of maximum DZ corrosion depth (3 measurements per location to generate stable estimate)
	Take XRF composition reading on outside of meter as control (3 measurements per location to generate stable estimate)
	Compare differences in composition between max DZ corrosion location and outside
	For each alloy, analyze composition differences by DZ water level
	Analyze differences between alloys for each same/similar DZ water level
Projected Meter Life Expectancy	For each meter calculate expected life: • Assume conservative estimate for meter life expectancy as when corrosion depth = half wall thickness: mm (wall thickness)/2 • Take max DZ corrosion: # µm • Calculate time it took to generate corrosion depth: 8 yrs/#µm • Life expectancy: 8 yrs/#µm * 1mm/1,000µm*mm (wall thickness)/2
	Within each DZ water level, compare differences in life expectancy based on alloy composition

RESEARCH AGREEMENT MODIFICATION

A. The Parties

Sponsor:	California Metals Coalition 2971 Warren Lane El Dorado Hills, CA 95762	Virginia Tech:	Virginia Polytechnic Institute and State University Office of Sponsored Programs North End Center, Suite 4200 300 Turner Street NW Blacksburg, VA 24061

B. Modification:

Modification Number: 5 to
Agreement Number: Agreement (The "Agreement") Dated: April 21, 2015

C. Purpose of Modification

To provide an increase to the existing project and extend the end date.

D. Description of Modification

Now, therefore, for and in consideration of the mutual covenants and agreements contained herein, the receipt and adequacy of which is hereby acknowledged, the Parties agree as follows:

E. Award Amount

Shall increase by $6,000 for a total of $68,000.00

F. Period of Performance:

Shall be extended to : January 31, 2017

G. Payment Schedule

Shall remain unchanged

H. Other

None

All other clauses within the original Agreement will not change and remain in full effect.

Sponsor: California Metals Coalition	Virginia Polytechnic Institute and State University Lauren P. Magruder
Name: James Simonelli Title: Executive Director Date: October 18, 2016	Lauren Magruder Director of Pre Award Date: 10/18/2016

MEMORANDUM OF UNDERSTANDING
BETWEEN

California Metals Coalition
and
Japan Measuring Instruments Federation

This MEMORANDUM OF UNDERSTANDING (MOU) is hereby made and entered into by and between the California Metals Coalition, hereinafter referred to as "CMC," and Japan Measuring Instruments Federation, hereinafter referred to as "JMIF."

A. PURPOSE: CMC is a full-service, statewide, non-profit organization representing California's metalworking industry. CMC's mission is to serve its members, which includes ingot manufacturers and producers of potable water products. JMIF is a Tokyo-based organization established to further technological development of measuring instruments that will benefit the measuring industry as a whole and thereby ensure the economic development of Japan as a whole. JMIF's members include manufacturers of water meters, and suppliers to the meter industry.

B. CALIFORNIA METALS COALITION SHALL: Retain the University of California Los Angeles (UCLA) to coordinate the procurement of water meters that have been in service in Japan. UCLA will establish a list of Japanese cities and criteria for water quality and water meter procurement. This information will be shared with JMIF with the intent of securing qualified meters for research testing.

C. JAPAN MEASURING INSTRUMENTS FEDERATION SHALL: Work with UCLA, and as needed CMC, to research, locate, confirm and secure water meters from Japan for research testing. JMIF will provide CMC a weekly email update regarding the cities visited in Japan and status of securing meters.

D. COMPENSATION: CMC will reimburse JMIF US $1,000 for each visit to a Japan municipality to secure meters, plus direct travel expenses up to US $1,000 per visit. The total budget for compensation shall not exceed US $5,000. CMC is not liable to reimburse JMIF for staff time prior to each visit, equipment or equipment use, supplies, damages, or insurance.

E. REIMBURSEMENT: CMC will reimburse JMIF for packaging of water meters. The estimated expense is US $100 per package. The total reimbursement budget is not to exceed US $1,000. If a water utility suggests expenses, JMIF will notify CMC of the expense before incurring any expenses.

F. COMMENCEMENT/EXPIRATION/TERMINATION: This MOU takes effect upon the document signing date, and shall remain in effect until June 30, 2016. It is the intention of both parties to extend this agreement, if needed. Either CMC or JMIF may terminate this MOU with a 3-day written notice.

G. AUTHORIZED REPRESENTATIVES: By signature below, the parties of CMC and JMIF, respectively, authorize this agreement.

Shigeru Hori	James Simonelli, Executive Director, CMC
JMIF	
January 12, 2016	January 8, 2016
Date	Date